

Developing a methodology for using web map services to help international organizations in Syria

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Absztrakt: A 2011-ben kezdődött szíriai polgárháború okozta a 21. század legnagyobb menekült- és kitelepítési válságát. Ez oda vezetett, hogy számos nemzetközi segélyszervezet komoly erőfeszítéseket tett a különböző munkaterületeken megvalósuló projektek és tevékenységek támogatására.

Jelen projektben azt tanulmányoztuk, hogy Szíriában működő nemzetközi szervezetek miként használják a jelenlegi térképszolgáltatásokat. A kutatás középpontjában olyan metodológia kidolgozása áll, amely lehetővé teszi, hogy a nemzetközi szervezetek hatékonyan kezeljék a webes térképszolgáltatásokat, és konkrét ajánlásokat és iránymutatásokat ad a webtérkép-szolgáltatások használatára. Ilyen formában a különböző (mezei és professzionális) felhasználók részére interaktív térképekkel szolgáltatathatnak információkat és adatokat a szervezet tevékenységéről.

Több webes térképszolgáltatás meglátogatása után választottuk ki az ArcGIS Online-t, amely a projektünkben szükséges legtöbb szolgáltatást ingyenesen nyújtja, és hasznos opciókat biztosít a térképrétegek létrehozására, szerkesztésére és megjelenítésére, valamint interaktív webalkalmazások fejlesztésére.

A metodológiát több részre osztottuk: adatok előkészítése, adatbázistervezés, a térképi alap rétegeinek az összekapcsolása, illetve a rétegek szerkesztése. Ezután a humanitárius adatok felhasználásával megkezdődött a szíriai szervezetek tevékenységét interaktívan bemutató térképek tervezése, és végül az elérhető alkalmazásokon keresztül megjelentek maguk a térképek.

Abstract: Starting in 2011, the Syrian civil war has caused the world's largest refugee and displacement crisis of the 21st century, which has made many international organizations guide their efforts to support projects and activities in various fields of work.

The research idea focuses on developing a methodology that allows international organizations to deal efficiently with web map services, which give specific recommendations and guidelines for the use of web map services by international organizations to provide information and data on the activities of this organization in the form of various interactive maps according to the different users (public and professional users).

After visiting several websites that offer web map services, ArcGIS Online was selected, which provides most of the services we need in our project for free and provides useful options for creating, modifying and displaying map layers as well as developing distinctive interactive web applications.

The methodology will be summarized in several stages, starting with preparing the data, designing the database, joining it with the base map layers, uploading the layers. The work followed with the design of interactive maps on the activities of organizations and humanitarian data in Syria, and terminated with the publication of these maps through the available applications.

Kulcsszavak: web map services, ArcGIS Online, international organizations, humanitarian data

Keywords: webes térképszolgáltatások, ArcGIS Online, nemzetközi szervezetek, humanitárius adatok

Introduction

The Syrian Arab Republic is an Arabic country in Western Asia, bordered by Lebanon and the Mediterranean Sea to the west, Turkey to the north, Iraq to the east, Jordan to the south, and shares maritime borders with Cyprus. The country occupies an area of 185,180 km². It is divided administratively into 14 governorates; Damascus is the capital city.

The Syrian civil war began more than ten years ago and is one of the most devastating and deadly wars in the twenty-first century. The Syrian refugee crisis remains the world's

largest refugee and displacement crisis of our time, according to UNHCR¹. More than 6.6 million Syrians have been forced to flee their country since 2011, nearly 5.5 million refugees have found refuge in neighbouring countries, particularly Turkey, Lebanon, Jordan, Iraq, and Egypt. Furthermore, 6.7 million people remain internally displaced. The civil war has led to the collapse of the Syrian economy and a decrease in the standard of living and health. With the imposition of international

sanctions, most families have lost the ability to buy food, medicine, and the basics of life, and 90% of the population lives below the poverty line. According to the UN Office for the Coordination of Humanitarian Affairs (UNOCHA)², the number of people in need of humanitarian assistance increased by 21% in 2021, reaching 13.4 million people, with 1.48 million in catastrophic need. According to UNOCHA³ in 2022

² Source: <https://www.hrw.org/world-report/2022/country-chapters/syria>

³ Sources: from UNOCHA 2022 report under the name Humanitarian Needs Overview: <https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/>

¹ Source: <https://www.unrefugees.org/news/syria-refugee-crisis-explained/>

report, a 14.6 million people need humanitarian assistance, an increase of 1.2 million from 2021.

Presently, there are many international organizations in Syria that work in various fields, and among the most effective and widespread are:

1. The International Committee of The Red Cross (ICRC).
2. World Food Programme (WFP).
3. The UN Refugee Agency (UNHCR).
4. Food and Agriculture Organisation of the United Nations (FAO).
5. International Federation of Red Cross and Red Crescent Society (IFRC).

Web Map Service (WMS)

Web Map Service: defines an interface that enables a client to obtain geospatial data maps as well as detailed information on specific features displayed on the map. The term “map” refers to a visual representation of geospatial data, not the data itself, which enables the visualization of geographic data on the Internet. This standard does not provide the actual geospatial data; instead, it just provides a georeferenced image.

Status quo of using web map services by international organizations in Syria

International organizations operating in Syria suffer from the lack of proper regulation and indications of appropriate use of web map services. Some of these organizations do not use these services at all, while others use static web map services in PDF or image format. Interactive web map services are used in a very limited range, sometimes in a way that does not achieve the goal for which they were created.

We can include most affective web mapping services used by organizations in the following list:

a) **ReliefWeb** is a humanitarian information service provided

by UNOCHA, which is a static web mapping service using images or PDF files. ReliefWeb monitors and collects information from many sources. From this website the user can download reports and statistics dedicated to a project containing more precise geographical data, which is represented on maps and infographics in PNG or JPG format that can be downloaded on this site.

- b) **Humanitarian Response** is a humanitarian service provided by UNOCHA. Humanitarian Response provides information that helps the work of these organizations in times of emergency need. It operates on mobile platforms and is available in different languages.
- c) **WFP GeoNode** is a platform for the management and publication of geospatial data, integrated creation of data, metadata, and map visualizations in a complementary manner, designed to be a flexible platform that software developers can modify.
- d) **The Operational Data Portal (ODP)** is a website created by the United Nations High Commissioner for Refugees (UNHCR). The ODP provides data and information on all persons of concern to UNHCR (refugees and asylum seekers, IDPs, etc.).
- e) The UNOCHA data site is one of the largest websites for displaying humanitarian activities data.
- f) **Humanitarian Data Exchange (HDX)** platform is another great resource site for sharing data related to humanitarian work. It contains geographic and non-geographic data, and the source of this data is UNOCHA. The platform is maintained by UNOCHA, and it has hundreds of layers ready to be downloaded and used in analysis.
- g) **The Global Shelter Cluster (GSC)** is a public platform co-chaired by IFRC and UNHCR at the global level. GSC is a mechanism coordinating an Inter-Agency Standing Committee

(IASC). GSC is a website dedicated to the sharing and exchange of shelter information in a specific region as well as globally, and it is a resource for real-time documents and materials.

After thorough consideration about the current situation of using web map services to view and disseminate the activities of organizations operating in Syria, the idea of research came to obtain a methodology that leads these organizations and directs them in an appropriate manner to represent their activities using web map services in order to achieve fast access to accurate information according to the type of users (specialists or public in general).

Available Web Map Services

There are several sites and platforms including online map services and dashboard services, creating web maps, managing their data and representing data with different map- and diagram-based solutions. After visiting several sites that provide these services, the most relevant sites related to the current research project are as follows:

- a) **iMapBuilder Online** is easy to use and rich in features suitable for different users. Users can create interactive maps based on the cloud and import their map data and copy the maps in their presentation through the platform directly without installing or downloading the application; no coding or API knowledge is required.
- b) **ArcGIS Online** is a cloud-based service for creating maps and analysing data. Users need to create their own accounts to be able to create maps, analyse data, and also create many specialized applications. These data and maps are stored in a private and secure infrastructure, users can keep their maps and data privately or share them with their colleagues anywhere, also access to all the data, maps, and applications available to users around the world.

files/documents/files/hno_2022_final_version_210222.pdf, p. 8

- c) **Datawrapper** is a platform specifically developed for newsrooms and government institutions, but can also be accessed by any interested user. After uploading your data to the platform, you can use it to build three different sorts of visualizations.
- d) **Google My Maps**, users of Google My Maps service can easily create custom maps of places of interest (such as tourist maps), and have the option to instantly make maps from imported spreadsheets, also embed maps in their website or blog, and users can collaborate and share all their maps.
- e) **Mapbox** is a powerful platform that provides dynamic maps with a variety of features with the abilities to create customizable and interactive maps. After creating an account on Mapbox, users can start benefiting from the platform's products and solutions.

Workflow methodology

The previous chapter explained that there are many websites providing web map and dashboard services with different capabilities. After carefully identifying the advantages of each of them, we relied on the services offered by ArcGIS Online website to create our maps and build the methodology of this research. ArcGIS Online is one of the largest and most popular mapping sites in the world, which provides most of the services we need in our project for free and provides great options in creating and modifying the display of map layers, offering distinctive designs of the symbology and effects that help to attract the reader's attention to the most important elements of the map and its understanding. Another very important factor that influenced this decision was that the website also provides numerous applications (configurable, instant apps, and StoryMaps) with special capabilities that are difficult to find on another similar websites.

The methodology will be summarized in the following steps

- a) **Base map of the Syrian Arab Republic:** There are several ways to obtain a base map, including digitizing old maps, using aerial images, etc. or downloading ready-made layers of the base map from a reliable source as in our case. The base map layers have been downloaded from the UNOCHA website HDX, which contains a huge database for the entire Syrian territory. The administrative divisions layer for Syria contains all the governorates and the subdivisions layer for the sub-districts and populated places.
- b) **Data visualisation:** It is not always easy to select the correct method or solution for data visualization. In our case, thematic maps are the appropriate cartographic solution to represent the distribution of organization's activities. Thematic maps are special purpose maps, which represent structural characteristics for some geographical distributions of physical, social or cultural phenomena. Thematic maps draw attention to particular aspects in order to portray the geographic distribution of statistical of data. There are different methods of representation used in thematic cartography. In our specific case, the following methods were used for the representation of:
 - 1. **Primary (absolute, original) data:** Primary (absolute, original) data, e.g., Garden grant in Syria WFP 2020 (by Households).
 - 2. **Relative data and ordinal (sequence) data:** the representation used area colouring, e.g., Food security numbers as a percentage of population (by %).
- c) **Preparing the layers:** We used QGIS open-source software to prepare layers for uploading them to ArcGIS Online. First, we add the data tables (.xlsx) to the

software by using 'Join' to join it to the base map layers (add the attribute data to the geographic borders). The base layer to which the data will be added is determined. This is done after selecting the table to be added and the field common to the layer to which attribute data is also added. It should be noted that adding attribute data to the layer is temporary, and if we wish, as in our cases, to permanently save the layer with the data, it must be exported as a new layer. A coordinate reference system (CRS) should be defined for the new layer: WGS 84 coordinate system was selected because the map workspace in ArcGIS Online site is also defined with the WGS 84 system.

- d) **ArcGIS Online guidelines:** The steps for working on ArcGIS are six steps from creating an account to publishing (Figure 1):
 1. **Creating a public account:** There are several types of accounts that can be used (professional, public, etc.), but in this research a free public account was used with all the capabilities it provides.
 2. **Uploading the layers to ArcGIS Online:** Users can upload the layers in GeoJSON formats and save it in the server in order to use it in several different maps.
 3. **Map making and visualization:** The first step to create a map is to add the necessary layers to each map. It depends mainly on the goal of the map and the type of users directed to them. User should select the attribute data which is necessary to build the design after adding the layers, and select the appropriate drawing style from several styles available according to the data. We choose Natural breaks classification method and, in this method, we concentrate similar values within isolated intervals. In one interval there is maximum homogeneity in the data groups.

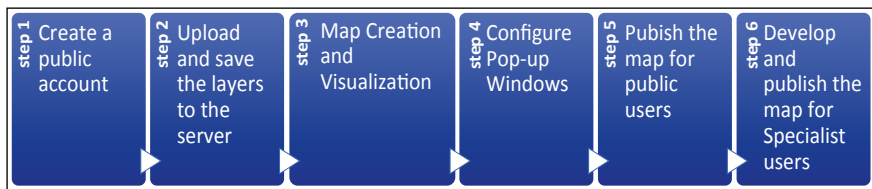


Figure 1. Guidelines for a workflow in ArcGIS Online

4. **Configuring Pop-ups:** Users can take advantage of the Pop-up window in order to clarify the attribute information and show the exact statistical values to the user by clicking on the place where the user wishes to know more detailed information on the map (Figure 2). Through the Configure Pop-up window of each layer, it is possible to set a title for the Pop-up window, choose and modify some settings, and the most important feature is the creation of statistical charts for specific data.

5. **Publishing a map for the public in general:** The StoryMaps application will be relied on publishing maps of organization’s activities to the public in general, who are not specialists. StoryMaps can give general information about the organization’s activities to visitors, including an introduction to the organization’s activity and an explanation of the grant, with a statistical chart on the beneficiary families, as well as Sidecar maps showing the locations of the grant

distribution in general and the number of beneficiary families and an overview of the humanitarian situation there, while pictures and videos can also be added.

6. **Developing and publishing the map for specialists:** Maps for specialists are distinguished by the abundance and accuracy of the represented data. Therefore, we need to add layers that give more accurate data in terms of location and statistics as well. Creating a map for specialists implies that we need to visualize the layers with appropriate colours and symbols, providing clear and accurate information about the organization’s activity in this area. We need to prepare a database (Figure 3) that contains detailed data on the number of beneficiary

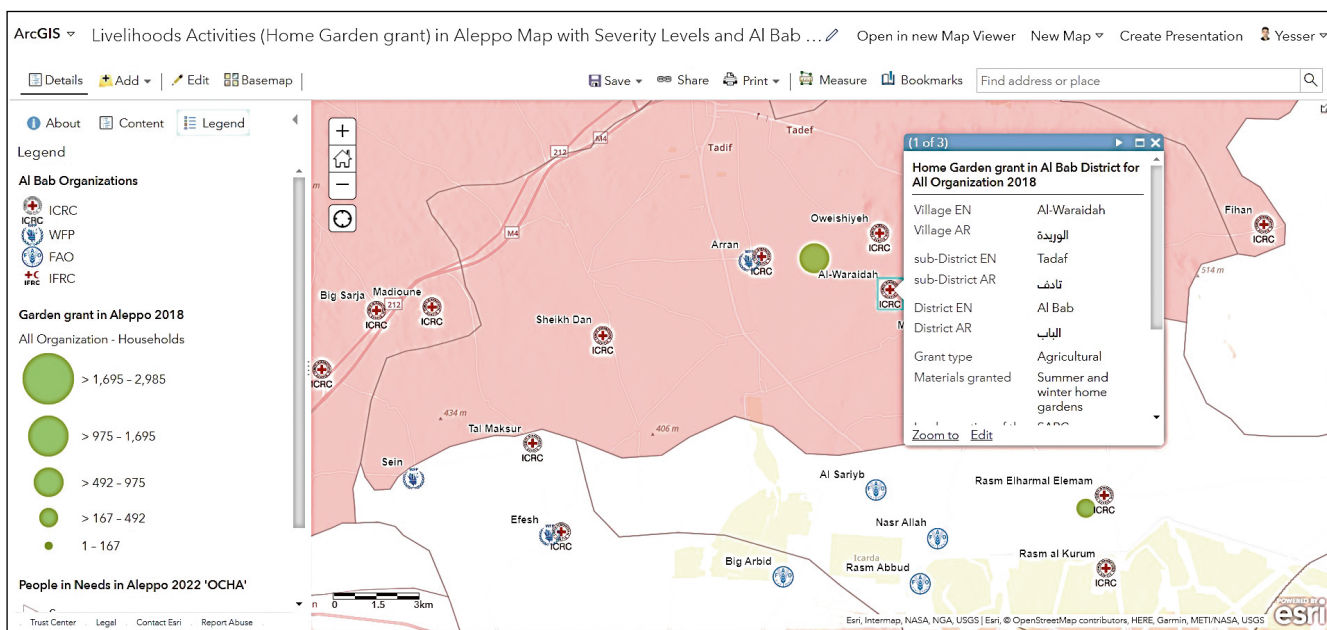


Figure 2. Pop-up window showing detailed information when user clicks on the symbols in the map

| Village EN | Village AR | sub-District EN | sub-District AR | District EN | District AR | Grant type | Materials granted | Implementing of the grant | Funding and supporting of the grant | Date | Households |
|----------------|----------------|-----------------|-----------------|-------------|-------------|--------------|--------------------------------|---------------------------|-------------------------------------|------|------------|
| Fihan | فيهان | Al'rima | عريمة | Al Bab | الباب | Agricultural | Summer and winter home gardens | SARC | ICRC | 2018 | 49 |
| western Alkola | مناخنة الغربية | Deyr Hafir | دير حافر | Al Bab | الباب | Agricultural | Summer and winter home gardens | SARC | ICRC | 2018 | 3 |
| Rasm Al Hamyer | رسم الحمير | Tadaf | تادف | Al Bab | الباب | Agricultural | Summer and winter home gardens | SARC | ICRC | 2018 | 9 |
| Taanah | طانة | Al Bab | مركز الباب | Al Bab | الباب | Agricultural | Summer and winter home gardens | SARC | ICRC | 2018 | 58 |
| Al Khirba | الخيربة | Tadaf | تادف | Al Bab | الباب | Agricultural | Summer and winter home gardens | SARC | ICRC | 2018 | 16 |
| Al-Waraidah | الوريدة | Tadaf | تادف | Al Bab | الباب | Agricultural | Summer and winter home gardens | SARC | ICRC | 2018 | 32 |
| Rasm Elabed | رسم العبد | Eastern Kvaires | كويرس شرقي | Al Bab | الباب | Agricultural | Home Garden | Department of Agriculture | WFP | 2018 | 53 |
| Efesh | عفش | Eastern Kvaires | كويرس شرقي | Al Bab | الباب | Agricultural | Home Garden | Department of Agriculture | WFP | 2018 | 39 |

Figure 3. Databases that contain detailed information about villages and grants

families and information about the grant, the type of grant, and the organization supporting the project. Therefore, the database must be prepared from the statistics and primary data that the organization already owns. In our case, we have one layer for several organizations that support similar projects, and we want to represent with a symbol the organization supporting the project grant in each village (this detailed points layer is hidden and appears when user zooms in to a specific scale). Organization name, grants name, and date layers can also be added. Each layer contains a separate database for each organization and according to a specific grant, that is, if the user wishes to know the villages supported by an organization with a specific grant in a particular year, the user turns on the appropriate layer to obtain this information. Maps can be published for specialists, including StoryMaps, and other applications can be used within the ArcGIS Online to give greater and more attractive, interactive solutions for users to zoom in the map and access data easily and accurately. Sidebar Instant application was used to publish the map for specialists. This application gives us the option to display the map with the legend of each layer, as well as control the selection of the displayed layers, control the scale of the map width, and the feature of the pop-up window when clicking on the element you want to know accurate details about.

7. Humanitarian Data Maps for International Organizations: This method can also be used to produce maps not only for the activities of organizations, but also help international organizations to assess the situation of a particular district or to make a decision to direct

the activities of the organization to support a more needy area by showing humanitarian data and statistics on an interactive map of that area. In this case, it is very useful to publish this map by configuring an Instant map called Basic. It is easy to publish and gives the reader wide access to map information and can take a screenshot to any part of the map.

ArcGIS Experience Builder capabilities can be used to create an internal inter-organizational web application designed in a way that displays all activity data, statistics of humanitarian data and all types of charts, as well as publishing previous interactive maps with the option to share these maps and data representations together to acquire the information smoothly.

Practical use of the methodology

First, to implement the methodology in a practical way, we collect data on two types:

- a) **General Data**: Many organizations operating in Syria have websites that contain general information about the activities of these organizations and their statistics within the areas in which they operate. In this project, part of the general data published in these sites was relied on, for example, the **WFP GeoNode** website (Map of Livelihoods Interventions 2020), and **Humanitarian Response**, which is a humanitarian service provided by UNOCHA (People in Need datasheet 2022).
- b) **Specific Data**: International organizations usually do not publish any detailed data specifically related to a project or activity for the public. In this research, specific data was obtained from several organizations, because the **Researcher** was working as a GIS specialist in the Syrian Arab Crescent Organization – the national partner for

some organizations –, which enabled me to obtain some more detailed data and use it in the templates of this research. Some specific data was obtained from **Humanitarian Response** website. It was statistical data that helped the organization in making decisions in future projects.

Conclusions

Since 2011, Syria has suffered a major humanitarian crisis, exacerbated by the years of war, and many international organizations are currently working in Syria to help the Syrian society to rise again in various walks of life. The research has organized the use of web map services to display the data of grants and activities of organizations in Syria, and to customize them according to users (public or specialists). The methodology gives guidance for the workflow to create web maps about the work developed by the organizations, as well as special applications for the public (StoryMaps) and specialists (Sidebar app). In the end, it is possible to use this methodology to show the humanitarian data (Basic app) that help organizations to take the decision to support certain areas most in need. Here, a more advanced solution was proposed for the developers (ArcGIS Experience Builder).

The resulting maps models as an application of the methodology:

1. **For public**: WFP Livelihoods Activities in Syria (Garden grant). Map with Ratio of People in Needs, Published as a StoryMaps (Figure 4). Link: <https://arcg.is/105PiT>
2. **For specialists**: Livelihoods Activities (Home Garden grant) in Aleppo. Map with Severity Levels and Al Bab district, Published as a Sidebar app (Figure 5). Link: <https://arcg.is/TXz9W>
3. **For displaying Humanitarian data**: Map of People in Needs in Syria and Aleppo – OCHA 2022, Published as a Basic app (Figure 6). Link: <https://arcg.is/0TWuq80>

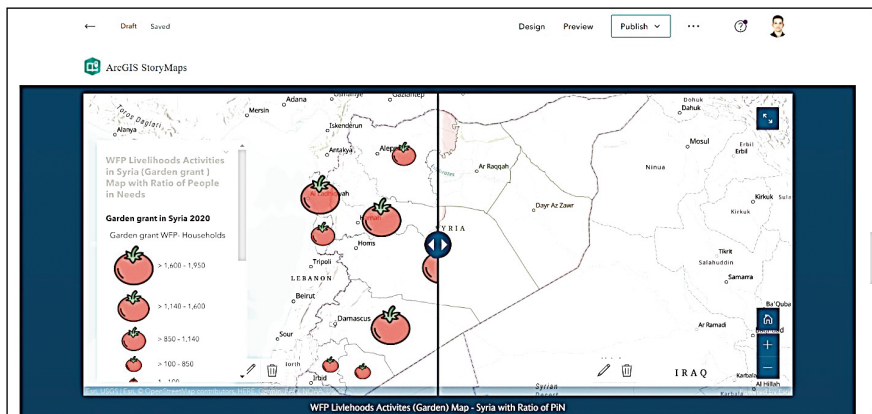


Figure 4. StoryMaps, Swipe media tool

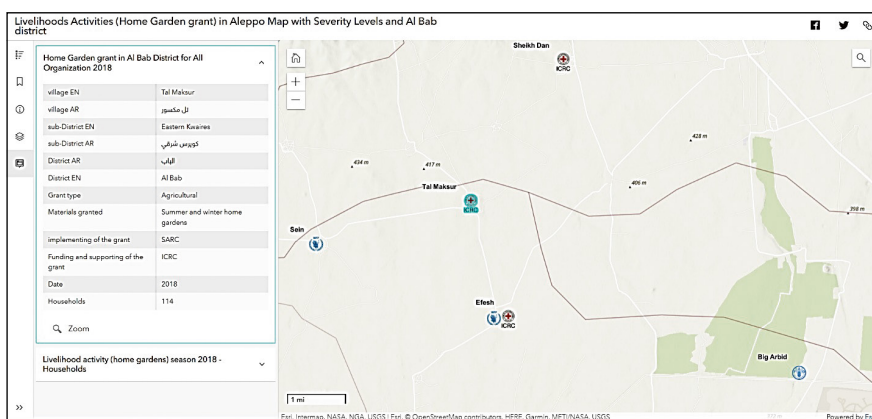


Figure 5. Viewing Livelihoods Activities in Aleppo, Sidebar app as a visitor

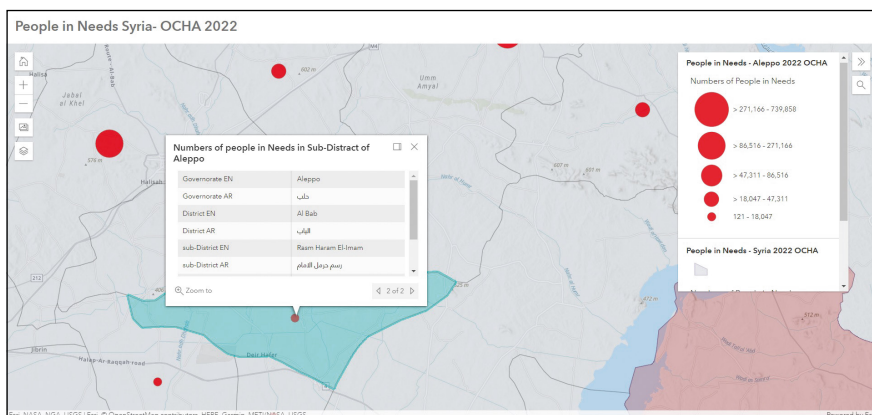


Figure 6. View People in Needs in Aleppo using the Basic app as a visitor

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